REMARKS

Applicants' representative thanks the Examiner and Primary Examiner for the courtesies extended during the telephonic conference on May 2, 2007, with Francis Dunn. During the conference, there was discussion regarding the rejection of independent claim 1 including discussion regarding the "width of words." There was also discussion regarding proposed amendments to independent claims 24 and 25 to further emphasize distinctive aspects of the claimed subject matter relating to hash tables.

Claims 1-42 are currently pending in the subject application and are presently under consideration. Claims 1, 3, 4, 23-26, 33, 38-40, and 42 have been amended as shown on pages 2-13 of the Reply. No new matter has been added and the amendments made herein will not require a new search.

Favorable reconsideration of the subject patent application is respectfully requested in view of the comments and amendments herein.

I. Rejection of Claims 1-4, 7-9, 11-12, 19-22, 24-26, 33-36, and 38-42 Under 35 U.S.C. § 103(a)

Claims 1-4, 7-9, 11-12, 19-22, 24-26, 33-36, and 38-42 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zhao (US 6,487,301) in view of Bresler, *et al.* (US 2003/0152293). It is requested that this rejection be withdrawn for at least the following reasons. Zhao and Bresler, *et al.*, alone or in combination, do not disclose, teach, or suggest each and every element of the subject claims.

> To reject claims in an application under § 103, an examiner must establish a *prima facie* case of obviousness. A *prima facie* case of obviousness is established by a showing of three basic criteria. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *See* MPEP § 706.02(j). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the

prior art and not based on applicant's disclosure. *See In re Vaeck,* 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicants' claimed subject matter relates to indexing and/or retrieval of a stored electronic document by comparing a signature related to the document with a signature related to an image of a printed document corresponding to the stored document. The claimed subject matter can utilize word-level topological properties (*e.g.*, location of a word, width of a word, *etc.*) of the document to generate a signature for that document, thereby enabling retrieval of the stored document (*e.g.*, stored image) more efficiently and expeditiously. Signatures that identify stored documents can be generated by obtaining data associated with the respective word-layouts within the documents. For example, a location of a word or a portion of words, or a width of words, within a document can be utilized to create a signature that robustly identifies a document, as a probability of two disparate documents having a substantially similar layout pattern is low. As further example, signatures can be represented by hash tables where each table location can correspond to a respective portion of a document. A data value can be entered into the table location based on the information (*e.g.*, word, blank space, *etc.*) at that corresponding portion of the document.

Signatures that represent word-layouts of electronic documents (*e.g.*, stored images) can then be compared with a signature of a later-captured image of a printed document, and the stored electronic document whose signature most closely matches the signature of the later-captured image can be retrieved, for example. For instance, where the signatures are represented as hash tables, a particular electronic document can be retrieved if that electronic document has the highest number of table locations that have values that match corresponding table locations of the captured document, as compared to other electronic documents.

In accordance with another aspect of the claimed subject matter, a multi-tiered comparison of the signature of the captured image and the signature(s) of the stored image(s) can be performed. For instance, a portion of the signature of a captured image can be compared to respective portions of signatures of stored images, and those stored images whose signature portion fails to match that of the captured image can be excluded

from further consideration. Subsequent iteration(s) can be performed to compare a smaller portion of the signature of the captured image and a smaller portion of the signature(s) of the remaining stored image(s), with the size of the signature portion becoming smaller with each iteration, until the number of stored image(s) reaches a predetermined threshold number. After the predetermined threshold number of remaining stored images has been reached, the remaining stored image(s) can be returned to the user and/or can each be further compared to determine which stored image most closely matches the captured image. Thus, indexing and/or retrieval of documents can be facilitated without requiring an exorbitant amount of resources or time.

In particular, independent claim 1 (and similarly independent claim 33, 38, 39, 40, and 42), as amended, recites: ***a comparison component that iteratively compares a portion of a signature associated with the captured image with portions of signatures respectively associated with the generated images and excludes each generated image whose portion of the signature does not match the portion of the signature of the captured image, the portion of the signature associated with the captured image and the portion of the signatures respectively associated with the generated images that are compared become progressively smaller with each iteration, where one or more iterations are performed until a predetermined threshold number of generated images remain***. Zhao and Bresler, *et al.*, alone or in combination, do not teach or suggest this distinctive feature of the claimed subject matter.

Rather, Zhao discloses techniques for incorporating authentication information into digital representations of objects using the authentication information to authenticate the objects. (*See* Abstract). Zhao further discloses selecting semantic information from a digital representation and using it to make a digest. (*See* col. 6, lns. 32-36). Semantic information in a digital representation of an image of a document is the representations of the alphanumeric characters in the document, where alphanumeric characters are understood to include representations of any kind of written characters or punctuation marks. (*See* col. 6, lns. 52-57). Zhao discloses determining the authenticity of a digital representation of an object by comparing its authentication information to the authentication information that can be stored in a storage system or can be semantic information in the digital representation which can be read. (*See* col. 4, lns. 15-33).

However, unlike the claimed subject matter, Zhao fails to disclose retrieving a document from a database by performing an iterative multi-tier comparison of a portion of a signature of a captured image to respective portions of signatures of generated images to exclude those generated images whose signature portion fails to match that of the signature portion of the captured image in order to facilitate retrieving the desired generated image that matches the captured image. Instead, Zhao discloses using a reader to scan the document and using image analysis software (*e.g.*, OCR-related software) to analyze the features of the document that make up the semantics information, which can be reduced to semantics data. (*See* col. 8, lns. 57-67). The semantics data of the document can be compared with a stored semantic digest to determine whether the digests match; and if they match, the comparison result will indicate that the document is authentic, and if they do not match, the result will indicate that the document is not authentic. (*See* col. 9, lns. 1-5). Thus, while Zhao discloses comparing semantic digests, to determine the authenticity of a document, Zhao is silent regarding facilitating retrieving a desired document from a data store by performing a multi-tier comparison of portions of signatures of captured images and generated images, where the signature portions can be smaller in size with each iteration, to eliminate those generated images whose signature portions do not match that of the captured image.

Further, Bresler, *et al.* fails to teach or suggest the distinctive features of the claimed subject matter. Rather, Bresler, *et al.* teaches locating selected points on a printed page of a publication and linking such points to various activities or other sources of information, such as a "chatterbox system" that enables a reader of text on the printed page to obtain audio information to accompany the reading of the text. (*See* p. 2, ¶¶ [0021], [0029]). Bresler, *et al.* also teaches blank space pattern matching (BPSM) that relates to a method of using local image information for locating a position in a page of text by capturing an image of the text of the page and generating a pattern of blank spaces comprising word and/or character spaces (*e.g.*, the spaces between two adjacent words, the spaces between two adjacent characters). (*See* p. 8, ¶ [0164]).

However, unlike the claimed subject matter, Bresler, *et al.* fails to teach or suggest retrieving a document from a database by performing an iterative comparison of a portion of a signature of a captured image to respective portions of signatures of

generated images stored in a data store, and excluding those generated images whose signature portion fails to match that of the captured image, based on signature portions that, with each iteration, can be smaller in size than the signature portions of the prior iteration. Instead, Bresler, *et al*. teaches presorting or binning for pattern match acceleration. (*See* p. 11, ¶ [0215]). Bresler, *et al*. teaches presorting a publication's patterns partitioning using various metrics that allow for partitioning in a certain number of bins per metric. (*See* p. 11, ¶ [0216]). Such metrics can include the following: the sum of all blank space widths in a given pattern; the percentage of white space in a pattern; the length of the line that corresponds to the end of a paragraph; the identity of the quadrants in the image that are substantially all-white; or page boundary information. (*See* p. 11, ¶ [0219] – p. 12, ¶ [0224]).

In contrast, the claimed subject matter can locate a match to a physical document, or captured image associated therewith, by searching word-level topological properties, such as the respective widths of words associated with generated images, to match a generated image(s) with the captured image and retrieve from a data store such generated image(s). To facilitate retrieving the desired generated image, a comparison component can perform a multi-tiered comparison to iteratively compare a portion of a signature associated with a captured image with corresponding portions of signatures associated with generated images that can be stored in a data store. Those signature portions of the generated images that do not match the corresponding portion of the captured image can be excluded from further consideration. The comparison component can then perform another tier of comparisons, as the comparison component can compare a smaller signature portion of the captured image to corresponding smaller signature portions of the generated images that remain in consideration, excluding those generated images whose smaller signature portion fails to match the smaller signature portion of the captured image. The comparison component can continue to perform iterative comparisons involving signature portions that can be smaller in size with each iteration until a predetermined threshold number of generated images remain for consideration.

Once the predetermined threshold number of generated images has been reached, the remaining generated image(s) can be returned to the user and/or can each be further compared to determine which generated image most closely matches the captured image.

Thus, indexing and/or retrieval of documents can be facilitated without requiring an exorbitant amount of resources or time.

Further, amended independent claim 25 (and similarly amended independent claim 24) recites: ***generating signatures corresponding to the generated images, each of the signatures is a hash table that contains a plurality of table locations where a respective value corresponding to a respective portion of a particular generated image is entered into a respective table location for each portion of the particular generated image; generating a signature corresponding to the captured image of the document, the signature is a hash table that contains a plurality of table locations where a respective value corresponding to a respective portion of the captured image is entered into a respective table location for each portion of the captured image.*** Zhao and Bresler, *et al.*, alone or in combination, fail to teach or suggest such functionality of the claimed subject matter.

Rather, Zhao relates to incorporating authentication information into digital representations of objects using the authentication information to authenticate the objects. (*See* Abstract). Zhao teaches one-way hashes normally used for digests are "cryptographic" in that the value of the digest reveals nothing about the value from which it was made by the hash function. (*See* col. 9, lns. 11-18). However, unlike the claimed subject matter, Zhao fails to disclose utilizing a hash table as a signature where the hash table can include table locations having certain values entered therein that can respectively correspond to respective portions of an image, such as a captured image or generated image.

Further, Bresler, *et al.* is silent regarding hash tables. Instead, Bresler, *et al.* teaches locating points on a page and linking such points to various activities or sources of supplemental information (*e.g.*, audio information to accompany a reader who is reading text on the page). (*See* p. 2, ¶¶ [0021], [0029]). Bresler, *et al.* also teaches identifying spaces between words on a page such that the spaces can create a unique pattern and using such blank space information to identify a position on a page. However, unlike the claimed subject matter, Bresler, *et al.* fails to teach utilizing hash tables as a signature of an image of a document. (*See* p. 9, ¶¶ [0164]-[0167]).

In contrast, the claimed subject matter can generate a signature for a captured image and signatures for each of the generated images. Each signature can be a ***hash table*** that can include a plurality of table locations, for example. Each of the table locations can correspond to a portion of an image and a value can be entered in the table, where the particular value entered can be based on the information contained in that portion of the image. For example, if there is a word(s) in that portion, a certain value can be entered in the corresponding location in the hash table; instead, if there is a space at that portion, a different value can be entered in the corresponding location in the hash table.

Moreover, independent claim 24, as amended, additionally recites: ***identifying a generated image that has a highest number of table locations that have respective values that match values in corresponding table locations associated with the captured image***. Zhao and Bresler, *et al.*, alone or in combination, do not teach or suggest this distinctive feature of the claimed subject matter.

Instead, Zhao teaches using semantic information (*e.g.*, alphanumeric characters) to create a digest that can be used to authenticate a document. (*See* col. 8, ln. 45 – col. 9, ln. 7). However, Zhao is silent regarding examining table locations of respective images, such as a captured image and generated images, to determine which generated image has the highest number of table locations that have a value that is the same value as that entered in corresponding table locations associated with the captured image. Rather, Zhao simply mentions one-way hashes are used for making digests. (*See* col. 5, lns. 46-49; col. 9, lns. 11-18). As stated *supra*, Zhao fails to teach using hash tables as a signature of an image associated with a document, let alone teach comparing signatures (*e.g.*, hash tables) of images to identify the generated image that most closely matches the captured image.

Further, Bresler, *et al.* is silent regarding table locations associated with a hash table, and thus, fails to teach or suggest identifying a generated image, from a plurality of generated images, that has the highest number of matching values in its hash table locations when compared to the values in corresponding hash table locations in a captured image.

In contrast, the claimed subject matter can compare the respective hash tables of a captured image and generated images that can be stored in a data store. Each of the table locations of the captured image can be compared to corresponding table locations of the generated images to determine whether the value entered in the particular table location of the captured image is the same value as that entered in a corresponding table location of each of the generated images. The claimed subject matter can identify the generated image that has the highest number of table locations in its hash table that match corresponding table locations associated with the captured image, as compared to the other generated images. The claimed subject matter can then retrieve the generated image with the highest number of matches, as that document can be the one that most closely matches the captured image, and therefore, such generated image can be the document desired to be retrieved, for example.

In view of at least the foregoing, it is readily apparent that Zhao and Bresler, et al., alone or in combination, fail to disclose, teach, or suggest each and every element of the claimed subject matter as recited in independent claims 1, 24, 25, 33, 38-40, and 42 (and associated claims 2-4, 7-9, 11, 12, 19-22, 26, 34-36). Accordingly, it is believed that the subject claims are in condition for allowance, and the rejection should be withdrawn.

II. Rejection of Claims 5-6 and 10 Under 35 U.S.C. § 103(a)

Claims 5-6 and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zhao in view of Bresler, *et al.*, and further in view of Ye, *et al.* "Document Image Matching and Annotation Lifting" (hereinafter referred to as Ye, *et al.*). This rejection should be withdrawn for at least the following reason. Zhao, Bresler, *et al.*, and Ming Ye, *et al.*, alone or in combination, do not teach or suggest each and every element of the subject claims. Claims 5, 6, and 10 depend from independent claim 1. Ming Ye, *et al.* fails to cure the aforementioned deficiencies of Zhao and Bresler, *et al.* as to independent claim 1. Accordingly, this rejection should be withdrawn.

III. Rejection of Claims 13, 23, 27, 29, and 37 Under 35 U.S.C. § 103(a)

Claims 13, 23, 27, 29, and 37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zhao in view of Bresler, *et al.*, and further in view of Shin-Ywan Wang, *et al.* "Block Selection: A Method for Segmenting Page Image of Various Editing Styles" (hereinafter referred to as Wang, *et al.*). This rejection should be withdrawn for at least the following reason. Zhao, Bresler, *et al.*, and Wang, *et al.*, alone or in combination, do not teach or suggest each and every element of the subject claims. Claims 13 and 23 depend from independent claim 1; claims 27 and 29 depend from independent claim 24; and claim 37 depends from independent claim 33. Wang, *et al.* fails to cure the aforementioned deficiencies of Zhao as to independent claims 1, 24, and 33. Accordingly, this rejection should be withdrawn.

IV. Rejection of Claim 28 Under 35 U.S.C. § 103(a)

Claim 28 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Zhao in view of Bresler, *et al.*, and further in view of Wang, *et al.*, and further in view of Ye, *et al.* This rejection should be withdrawn for at least the following reason. Zhao, Bresler, *et al.*, Wang, *et al.*, and Ye, *et al.*, alone or in combination, do not teach or suggest each and every element of claim 8. Claim 8 depends from independent claim 1. Wang, *et al.* and Ye, *et al.* fail to cure the aforementioned deficiencies of Zhao and Bresler, *et al.* as to independent claim 1. Accordingly, this rejection should be withdrawn.

V. Rejection of Claims 14-18, 30-32 Under 35 U.S.C. § 103(a)

Claims 14-18, 30-32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zhao in view of Bresler, *et al.*, and further in view of Bloomberg (US 5,181,255). This rejection should be withdrawn for at least the following reason. Zhao, Bresler, *et al.*, and Bloomberg, alone or in combination, do not teach or suggest each and every element of the subject claims. Claims 14-18 depend from independent claim 1; and claims 30-32 depend from independent claim 24. Bloomberg fails to cure the aforementioned deficiencies of Zhao and Bresler, *et al.* as to independent claims 1 and 24. Accordingly, this rejection should be withdrawn.

CONCLUSION

The present application is believed to be in condition for allowance in view of the above comments and amendments. A prompt action to such end is earnestly solicited.

In the event any fees are due in connection with this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-1063[MSFTP504US].

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact applicants' undersigned representative at the telephone number below.

Respectfully submitted,

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